

1562-13

**CORPORATE
ENGINEERING
DEPARTMENT**

APPROPRIATION ESTIMATE

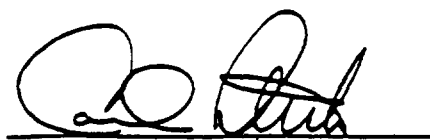
| | |
|--|-----------------------|
| CEA NO. 3808 | DATE April 6, 1983 |
| PROJECT TITLE Main South Trunk Sewer | |
| COMPANY MIC | LOCATION W.G.K. |
| PROBABLE ACCURACY +15 to - 15 Percent | |

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Attached is Appropriation Estimate Number 3808-02.0.

| | |
|---------|-------------|
| Capital | \$5,000,000 |
| Expense | 700,000 |
| Total | \$5,700,000 |


Cost Engineer

Approved by:


SPEO Superintendent

WGK 4084938

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Monsanto

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CE 42-112

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Monsanto

CORPORATE ENGINEERING DEPARTMENT
COST ENGINEERING SECTION

CEA NUMBER 3808

ESTIMATE NUMBER 3808-02.0

DATE April 6, 1983

COST ENGINEER C. R. Steib

ESTIMATE COMMENTS AND QUALIFICATIONS

PAGE 1 OF 10

PROJECT TITLE MAIN SOUTH TRUNK SEWER

LOCATION W. G. K.

COMPANY MIC

| CED ENGINEERING | PRIOR TO AN ESTIMATE ISSUE | | ESTIMATED TOTAL | |
|--|----------------------------|---------|-----------------|---------|
| | MAN-HOURS | DOLLARS | MAN-HOURS | DOLLARS |
| CED PRE-PROJECT ENGINEERING (CODE 2) | 2,300 | 85,000 | 2,300 | 85,000 |
| CONTRACT PRE-PROJECT ENGINEERING (CODE 2) | | | | |
| TOTAL PRE-PROJECT ENGINEERING (CODE 2) | 2,300 | 85,000 | 2,300 | 85,000 |
| CED PROJECT ENGINEERING (CODE 1) | | | 10,247 | 466,000 |
| CONTRACT PROJECT ENGINEERING (CODE 1) | | | | 20,000 |
| TOTAL PROJECT ENGINEERING (CODE 1) | | | 10,247 | 486,000 |
| TOTAL (CODE 1 & CODE 2) | 2,300 | 85,000 | 12,547 | 571,000 |
| % OF ESTIMATED TOTAL | 18 % | 15 % | | |
| COST ENGINEERING MAN-HOURS TO MAKE AN ESTIMATE | 112 | | | |

PROJECT DESCRIPTION AND CLASSIFICATION

This project will provide a new 42 inch diameter, Monsanto owned trunk sewer to carry all the plant sewer load now carried by the two Sauget Village sewers. The two existing village sewers are in a very deteriorated condition due to the high acidity of the plant wastes, and require extensive repairs. Repair of the village sewers will be the responsibility of the village.

The new sewer will combine most plant sewer loads into one discharge point where sampling and measuring devices will be provided. The exceptions are sulfuric acid manufacturing, the laboratory, and Lot A which discharge into the village sewer on the north side of the plant. The existing south plant sewer system has about nineteen discharge points into the village sewer.

SPEO Management has classified this as a Utilities project.

PROJECT DEFINITION REPORT

A Preliminary Project Definition Report dated March 28, 1983 was provided for preparation of this estimate. It contained quantities of material required for capital and expense categories.

WGC 4084939

KEY ASSUMPTIONS

This project will be constructed on a lump sum contractual basis using union shop construction labor.

Plant personnel will operate and maintain the dewatering wells.

REFERENCE TO SIMILAR PROJECTS

SPEO Management has concluded that this project does not compare well with other project historical data because of the depth of excavation and the expected soils and groundwater conditions. The existing sewer running parallel to this project's sewer was installed by the Village of Sauget, and historical information is not available on that project.

CEA 3088, North Trunk Sewer at W.G.K. was reviewed. Comparisons are not straight forward, installation was generally shallower and soil conditions and groundwater vary considerably.

CEA 3741, ACL Waste Pre-Treatment which is in the same general area of the plant as this project, is also using deepwells for dewatering, and information from that project was used in preparing the dewatering estimate for this project. CEA 3741 currently has 4 deepwells being operated by plant personnel.

RISK ANALYSIS

A Project Strategy Meeting was conducted on April 5, 1983 at which time the estimate was reviewed with key project participants. It was determined that the total estimate was acceptable as presented. Risk Reviews had previously been held on 8/12/82, 12/22/82 and 1/28/83.

This project is vulnerable to increased costs due to poor soils, high groundwater, proximity to existing structures, and prevailing weather conditions. The strategy to minimize cost and control groundwater via plant operation and maintenance of dewatering wells is based on a similar successful agreement with the trade unions on CEA 3741, ACL Waste Pre-Treatment. The same accommodation has been discussed with the unions for this project. Estimated cost and estimate accuracy do not include potential costs for trade union operation of the dewatering wells (as much as \$1,000k should we fail to get union agreement).

ESTIMATE ACCURACY

This estimate is believed to be accurate to within plus 15 percent to minus 15 percent.

CAPITAL DIRECTS

WGK 4084940

The capital direct costs are based on category descriptions in the PDR. All major capital work is estimated on a lump sum basis. All categories were estimated using unit prices. A conversion factor of

CAPITAL DIRECTS (continued)

1.6 was applied to labor costs for each category to account for contractor indirect costs and profit. This amount was added to the estimate for contractor purchased material, thus converting the T&M estimate to lump sum.

Category 15 - Sewers, Drains and Plumbing

This category comprises 95% of the total capital direct cost. Quantities for estimating labor and material were determined by using a definition divisor of 0.9 applied to quantities in the PDR. The total cost of material was estimated by using current material prices applied to the estimate quantities. Labor was determined by applying standard manhours to estimate quantities. This category includes all work related to the sewers, including excavation, backfill, sheet piling, concrete work, and acid brick in manholes.

OTHER CAPITAL COSTS

Since the estimate for this project is based on lump sum contract, the estimated cost for each category includes the contractor's profit and overhead costs. Other capital costs (in Area 50) are necessary to cover the capital and expense direct labor (time and material), and in support of the lump sum contractors. The estimate of other capital costs was provided by R. J. Murphy, Construction Site Superintendent, using zero based budgeting.

ENGINEERING

The engineering estimate was derived from manhour estimates by all involved personnel based on the "Task Method" of estimate engineering. March, 1983 CED budgeted engineering manhour rates were used for the estimate.

The following data is a summary of the pertinent facts relative to the engineering estimate:

| | |
|--|-------------|
| (1) Total Project Capital (Mid 82 Dollars) | \$4,700,000 |
| (2) Total Engineering Curve Mean Manhours (Mid 82) | 26,000 MHS |
| (3) Mean Adjustment Manhours Required | -15,573 MHS |
| (4) Total Engineering Manhour Estimate | 10,247 MHS |
| (5) Total Engineering Cost Estimated | \$ 486,000 |
| (6) Total Project Capital Estimated | \$5,000,000 |
| (7) Engineering Percent of Total Capital | 9.7% |

Estimated manhours are considerably lower than manhours indicated by the curve because this sewer project is less complex than the typical utilities project.

WGX 4084941

UNDEVELOPED DESIGN

No allowance is included in this estimate for undeveloped design.

CONTINGENCY - CAPITAL

A capital contingency of 8.3% of total capital has been included in this estimate. This amount was arrived at by using 8% of total capital and rounding upward to bring total capital to the nearest \$100,000.

COST ESCALATION ALLOWANCE

Cost escalation allowance has been included in this project, based on the following schedule:

| | |
|-----------------------|------|
| Base Date of Estimate | 3/83 |
| Design Start | 7/83 |
| Mid-Point of Project | 6/84 |
| Mechanical Completion | 5/85 |

All categories were escalated in accordance with the CED Escalation Summary issued November, 1982. Total project escalation amounts to approximately \$495,500 which is 11.0% of the base capital dollar estimate.

MAJOR COMPONENT ESCALATION IS AS FOLLOWS:

| <u>Component</u> | <u>\$ Escalation</u> | <u>% Escalation of Base Estimate</u> | <u>% of Total Base Estimate</u> |
|------------------------|----------------------|--|-------------------------------------|
| Equipment | 0 | 0 | 0 |
| Labor | 9,000 | 9.9 | 0.2 |
| Material | 1,000 | 11.0 | 0.02 |
| Lump Sum | 377,200 | 11.0 | 8.38 |
| Construction Indirects | 52,400 | 12.9 | 1.2 |
| Distributives | - | - | - |
| Transferred | - | - | - |
| Engineering | 55,900 | 13.0 | 1.2 |
| Total | 495,500 | | 11.0 |

WGX 4084942

CAPITAL EXPENDITURE FORECAST

The following capital expenditure forecast has been developed based on the anticipated schedule and conversations with project management.

| <u>Year</u> | <u>Expenditure \$</u> | <u>Cumulative %</u> |
|-------------|-----------------------|---------------------|
| 1983 | 580,000 | 33 |
| 1984 | 3,200,000 | 86 |
| 1985 | 1,220,000 | 100 |

PROJECT EXPENSE

Category 90 - Dismantling Expense was estimated from quantities listed in the PDR. All other expense categories were estimated using expense historical data available on completed projects at the Krummrich Plant. A factor of 110% of expense direct labor and material was used for distributives transferred to expense for time and material work, and 25% for lump sum.

CONTINGENCY - EXPENSE

An allowance of 14.0% of total expense is included in this estimate for expense contingency. This amount was arrived at by using 15% of total expense and rounding down to bring total expense to the nearest \$10,000.

Estimate Review Held April 20, 1983

Reviewed by: R. M. Collier

WGK 4084943

Monsanto Company
Corporate Engineering Department
Cost Engineering Section

Detailed Estimate Analysis

Project Title: Main South Trunk Sewer
Location: W. G. Krummrich

Description

| | |
|--------------------|-----------|
| Equipment | 1,000 |
| Labor | 291,800 |
| Material | 88,500 |
| Spares | 0 |
| Lump Sum | 3,784,300 |
| Land | 0 |
| Engineering | 419,900 |
| Contingency | 414,500 |
| Undeveloped Design | 0 |
| Other | 0 |

Total Capital 5,000,000

| | |
|-------------|---------|
| Labor | 271,900 |
| Material | 108,200 |
| Engineering | 66,100 |
| Taxes | 1,000 |
| Lump Sum | 154,800 |
| Contingency | 98,000 |

Total Expense 700,000

Total Project 5,700,000

CEA Number 3800
CE Estimate Number 3806
Estimate Date 4/6/83
Cost Engineer C.R. Steib

Company: MIC

| Description | Estimated Equip. Cost | | Lang Factor |
|-----------------|-----------------------|-----------------------|-------------|
| | Total Cost | Incl. Equip. Lump Sum | |
| M+E (Capital) | 4,585,500 | 1,000 | 4585.5 |
| Bldg. (Capital) | | | |
| Land | 0 | | |
| Other | 0 | | |
| Undev. Design | 0 | | |
| Contingency | 414,500 | | |
| Total Capital | 5,000,000 | | |

Approved: 
Project Manager

MONSANTO COMPANY
CORPORATE ENGINEERING DEPARTMENT
COST ENGINEERING SECTION

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PROJECT SUMMARY

CEA NUMBER 3808
SCOPE DATE 00/00/00
CE ESTIMATE NUMBER 3808-02.0
ESTIMATE DATE 04/06/83
COST ENGINEER C.R. STEIB
AREA/SECTION MANAGER F.A. MAYSE
PROJECT MANAGER B.J. SEVEY
ESTIMATE TYPE APPROPRIATION

PROJECT TITLE.....MAIN SOUTH TRUNK SEWER
LOCATION.....W G KNUMMICH PLANT

COMPANY..... MCI

| DESCRIPTION | EQUIPMENT | LABOR | MATERIAL | LUMP SUM | DISTRIBUTIVE | TOTAL COST |
|-------------------------------|--------------|----------------|---------------|------------------|------------------|------------------|
| INSTALLED M & E | 1,000 | 100,000 | 10,400 | 3,784,300 | | 3,895,700 |
| SPARES | | | | | | |
| LAND | | | | | | |
| BUILDINGS | | | | | | |
| CONSTRUCTION INDIRECTS | | | | | 456,500 | 456,500 |
| ENGINEERING - 10 PCT TOT CAP* | | | | | 486,000 | 486,000 |
| DISTRIBUTIVES TO EXPENSE | | | | | -252,700 | -252,700 |
| CONTINGENCY - 08 PCT TOT CAP* | | | | | 414,500 | 414,500 |
| OTHER | | | | | | |
| UNDEVELOPED DESIGN | | | | | | |
| TOTAL CAPITAL | 1,000 | 100,000 | 10,400 | 3,784,300 | 1,104,300 | 5,000,000 |

| | | | | | | |
|------------------------------|--------------|----------------|---------------|------------------|------------------|------------------|
| DISMANTLING | | 6,500 | | 41,600 | 18,000 | 66,100 |
| SALES & USE TAXES | | | | | 1,000 | 1,000 |
| REPAIRS | | 80,000 | 20,000 | | 110,000 | 210,000 |
| RELOCATIONS & MODIFICATIONS | | 46,600 | 11,400 | 113,200 | 92,800 | 264,000 |
| START-UP MODIFICATIONS | | 23,300 | 5,700 | | 31,900 | 60,900 |
| CONTINGENCY - 14 PCT TOT EXP | | | | | 98,000 | 98,000 |
| TOTAL EXPENSE | | 156,400 | 37,100 | 154,800 | 351,700 | 700,000 |
| TOTAL PROJECT | 1,000 | 256,400 | 47,500 | 3,939,100 | 1,456,000 | 5,700,000 |

APPROVAL - COST ENGR. SUPERVISOR...

DATE... 4/20/83

PROJECT MANAGER.....

DATE... 4/20/83

* PERCENT CALCULATION BASED UPON TOTAL CAPITAL MINUS UNDEVELOPED DESIGN

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NGK 4084945

MONSANTO COMPANY
CORPORATE ENGINEERING
COST ENGINEERING SECTION

CE ESTIMATE NUMBER..... 3A08-02.0
DATE..... 04/06/83
COST ENGINEER..... C.R. STELB

PROJECT CATEGORY SUMMARY

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PROJECT TITLE.....MAIN SOUTH TRUNK SEWER
LOCATION.....W G KRUMMRICH PLANT

COMPANY..... MCI

| CAT DESCRIPTION | PCT 01 | EQUIPMENT | LABOR | MATERIAL | LUMP SUM | TOTAL COST |
|-------------------------|----------|-----------|---------|----------|-----------|------------|
| 01 EQUIPMENT ITEMS | 100.0 | 1,000 | | | | 1,000 |
| 02 INSTRUMENT ITEMS | 1040.0 | | | 10,400 | | 10,400 |
| 03 S&T EQUIPMENT | 50.0 | | | | 500 | 500 |
| 04 S&T INSTRUMENTS | 1630.0 | | | | 16,300 | 16,300 |
| 06 EXCAVATION | 50.0 | | | | 500 | 500 |
| 07 FOUNDATIONS | 80.0 | | | | 800 | 800 |
| 09 OTHER BUILDING ITEMS | 200.0 | | | | 2,000 | 2,000 |
| 13 ELECTRICAL | 7310.0 | | | | 73,100 | 73,100 |
| 15 SEWERS DRAINS & PLBG | 378650.0 | | 100,000 | | 3,686,500 | 3,786,500 |
| 21 WALLS ROOF & ROOFING | 460.0 | | | | 4,600 | 4,600 |
| TOTAL CAPITAL DIRECT | 389570.0 | 1,000 | 100,000 | 10,400 | 3,784,300 | 3,895,700 |

| CAT DESCRIPTION | DISTRIBUTIVE | EQUIPMENT | LABOR | MATERIAL | LUMP SUM | TOTAL COST |
|-------------------------|--------------|-----------|---------|----------|-----------|------------|
| 90 DISMANTLING | 18,000 | | 6,500 | | 41,600 | 66,100 |
| 91 START-UP EXP - TAX | 1,000 | | | | | 1,000 |
| 92 REPAIR EXPENSE | 110,000 | | 80,000 | 20,000 | | 210,000 |
| 93 RELOC & MOD - EXP | 92,800 | | 46,600 | 11,400 | 113,200 | 264,000 |
| 94 START-UP RELOC & MOD | 31,900 | | 23,300 | 5,700 | | 60,900 |
| 99 CONTINGENCIES - EXP | 98,000 | | | | | 98,000 |
| TOTAL EXPENSE | 351,700 | | 156,400 | 37,100 | 154,800 | 700,000 |
| TOTAL EXCL AREA 50 | 351,700 | 1,000 | 256,400 | 47,500 | 3,939,100 | 4,595,700 |

MONSANTO COMPANY
CORPORATE ENGINEERING DEPARTMENT
COST ENGINEERING SECTION

CE ESTIMATE NUMBER..... 3A08-02.0
DATE..... 04/06/83
COST ENGINEER..... C.R. STEIN

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D I S T R I B U T I V E S U M M A R Y

PROJECT TITLE.....MAIN SOUTH TRUNK SEWER

LOCATION.....W G KRUMMICH PLANT

AREA NUMBER..50 AREA TITLE..... DISTRIBUTIVES

COMPANY..... PCI

| CAT DESCRIPTION | LABOR DISTRIBUTIVE | MATERIAL DISTRIBUTIVE | TOTAL DISTRIBUTIVE |
|-------------------------|-----------------------|--------------------------|-----------------------|
| 50 SITE BURDEN | 21,000 | 3,000 | 24,000 |
| 51 DIRECT LABOR BURDEN | 116,800 | | 116,800 |
| 53 CONSTR TOOL & SUPPLY | | 25,800 | 25,800 |
| 55 EQUIP RENTAL & SERV | | 58,400 | 58,400 |
| 58 PREMIUM WAGES | 115,000 | | 115,000 |
| 67 TEMPORARY FACILITIES | 54,500 | 62,000 | 116,500 |
| TOT CONSTR INDIRECTS | 307,300 | 149,200 | 456,500 |
| 80 CFD ENGINEERING | | | 466,000 |
| 81 OUTSIDE ENGINEERING | | | 20,000 |
| TOTAL ENGINEERING | | | 486,000 |
| 87 UNDEVELOPED DESIGN | | | |
| 89 CONTINGENCIES - CAP | | | 414,500 |
| TOTAL DISTRIBUTIVES | | | 1,357,000 |
| AA DISTRIBUTIVES TO EXP | | | -252,700 |
| TOT CAP DISTRIBUTIVE | | | 1,104,300 |

MSK 4084947

MONSANTO COMPANY
CORPORATE ENGINEERING
COST ENGINEERING SECTION

CE ESTIMATE NUMBER..... JR08-02.0
DATE..... 04/06/83
COST ENGINEER..... C.R. STEIB

ENGINEERING SUMMARY

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PROJECT TITLE.....MAIN SOUTH TRUNK SEWER
LOCATION.....W G KRUMMRICH PLANT
AREA NUMBER..50 AREA TITLE..... DISTRIBUTIVES

COMPANY..... MCI

| RESOURCE CENTER | NAME | MONSANTO MAN-HOURS | INTERNAL COST | TRAVEL | OUTSIDE ENGINEERING | TOTAL COST |
|----------------------------|-------------------------------|-----------------------|------------------|--------|------------------------|---------------|
| 31 | PD - MICC | 176 | 9,034 | | | 9,034 |
| 46 | SPEU (F) | 5,050 | 187,203 | 4,200 | | 191,403 |
| 47 | UTILITIES DESIGN | 80 | 3,709 | | | 3,709 |
| 49 | CONSTRUCTION | 3,875 | 168,872 | 16,000 | | 184,872 |
| 64 | CHEM ENGR | 100 | 6,373 | | | 6,373 |
| 71 | ACCOUNTING | 800 | 27,736 | | | 27,736 |
| 74 | PROCUREMENT | 166 | 7,496 | 1,200 | | 8,696 |
| 81 | | | | | 20,000 | 20,000 |
| 90 | ENGR SERVICES NON-DETAILED | | 34,122 55 | | | 34,122 55 |
| CAT 80 CED ENGINEERING | | 10,247 | 444,600 | 21,400 | | 466,000 |
| CAT 81 OUTSIDE ENGINEERING | | | | | 20,000 | 20,000 |
| TOTAL ENGINEERING | | | | | | 486,000 |

MCK 4084948